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Lee

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(54) **DRAINAGE DEVICE**

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(52) **U.S. Cl.** **4/286**; 4/287; 4/597; 4/665; 137/362
(58) **Field of Search** 4/286–289, 293–295, 4/665, 597, 605; 137/362, 872

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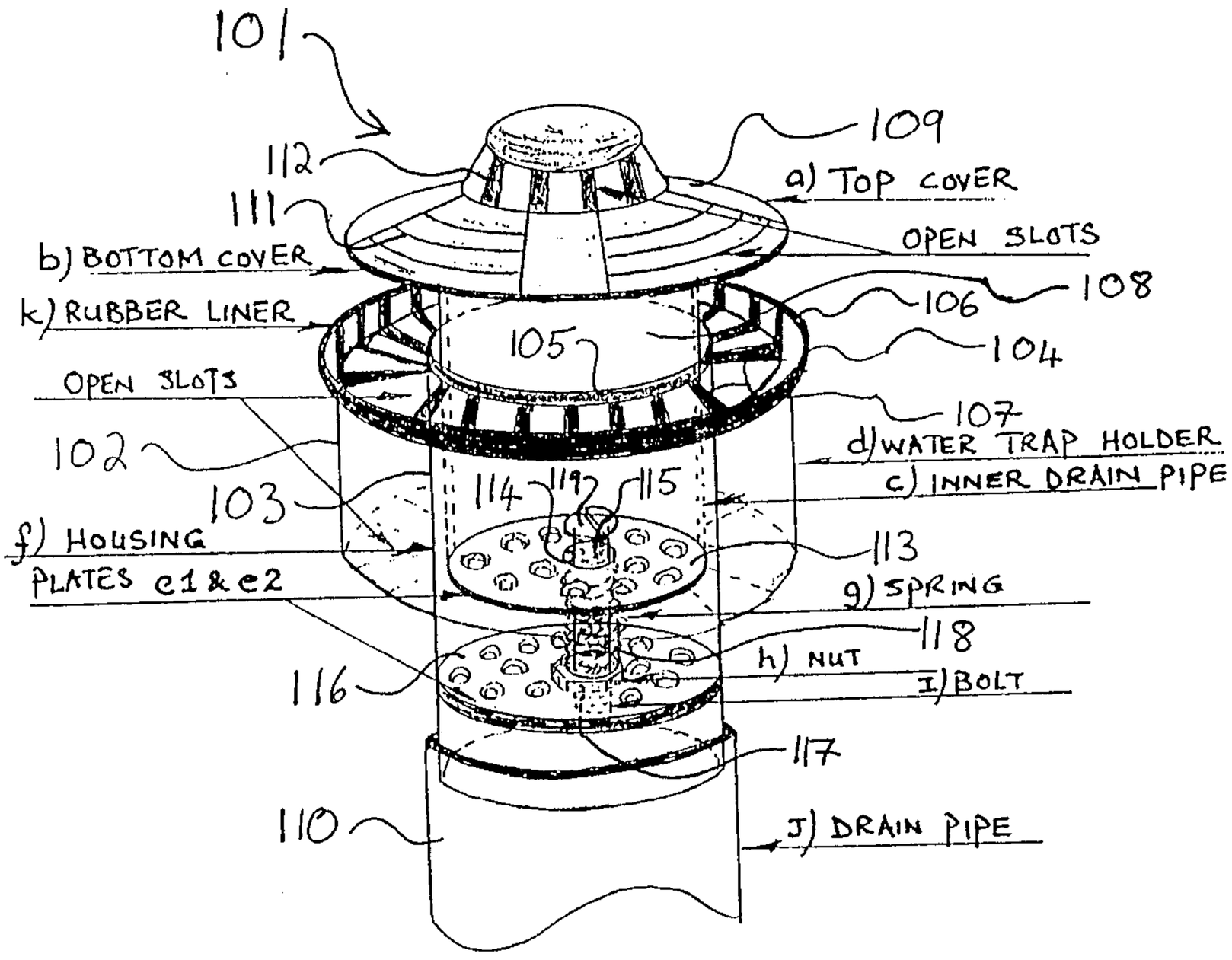
(57) **ABSTRACT**

A drainage device (**1**) for a waste water outlet (**12**) includes an outer tubular member (**102**) adapted to fit within the waste water outlet (**12**). An inner tubular member (**103**) is located within the outer tubular member (**102**). The interior of the inner tubular member (**103**) provides a first outlet and a second outlet is defined by the external wall of the inner tubular member (**103**) and the internal wall of the outer tubular member (**102**). A valve member (**108, 109**) is movably mounted with respect to the inner and outer tubular members (**102, 103**) for movement between a first position in which the second outlet is obturated and the first outlet is open to permit a liquid to flow therethrough, and a second position in which the second outlet is open to permit liquid to enter the second outlet.

11 Claims, 3 Drawing Sheets



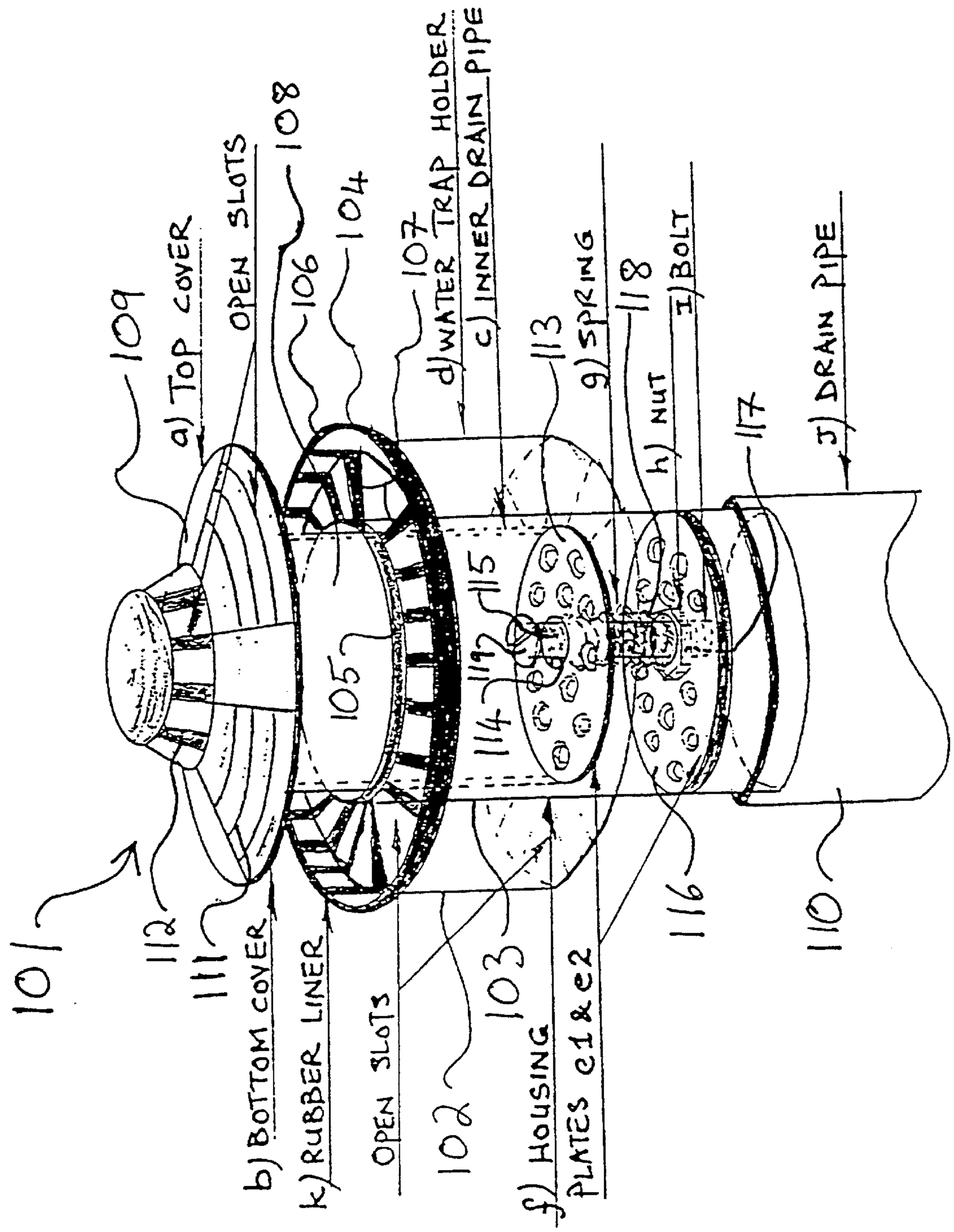

109
a) TOP COVER
OPEN SLOTS
108
106
104
107
d) WATER TRAP HOLDER
c) INNER DRAIN PIPE
113
9) SPRING
118
h) NUT
i) BOLT
117
j) DRAIN PIPE
101
112
111
b) BOTTOM COVER
k) RUBBER LINER
OPEN SLOTS
102
103
HOUSING
f) HOUSING PLATES e1 & e2
105
114
119
115
116
110

Figure 1

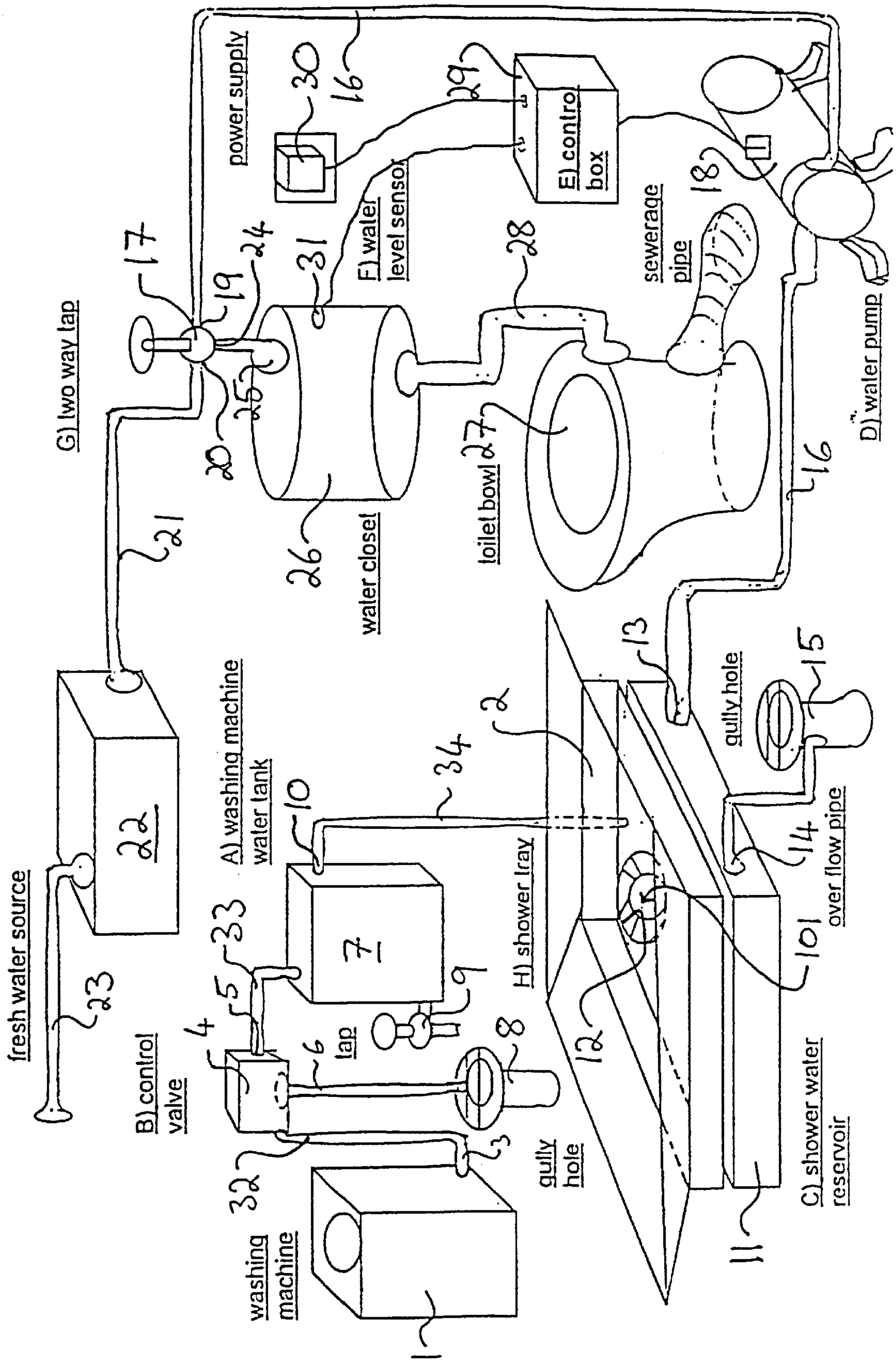

power supply
30
16
29
El contro box
18
sewerage pipe
El waler level sensor
31
24
19
17
28
G) lwo way tap
20
25
21
26
toilet bowl
27
waler closet
D) waler pump
16
fresh waler source
22
23
B) control valve
4
5
33
A) washing machine waler tank
7
10
34
2
H) shower tray
6
tap
8
9
12
13
gully hole
15
14
over flow pipe
101
3
32
washing machine
1
gully hole
C) shower waler reservoir
11

Figure 2

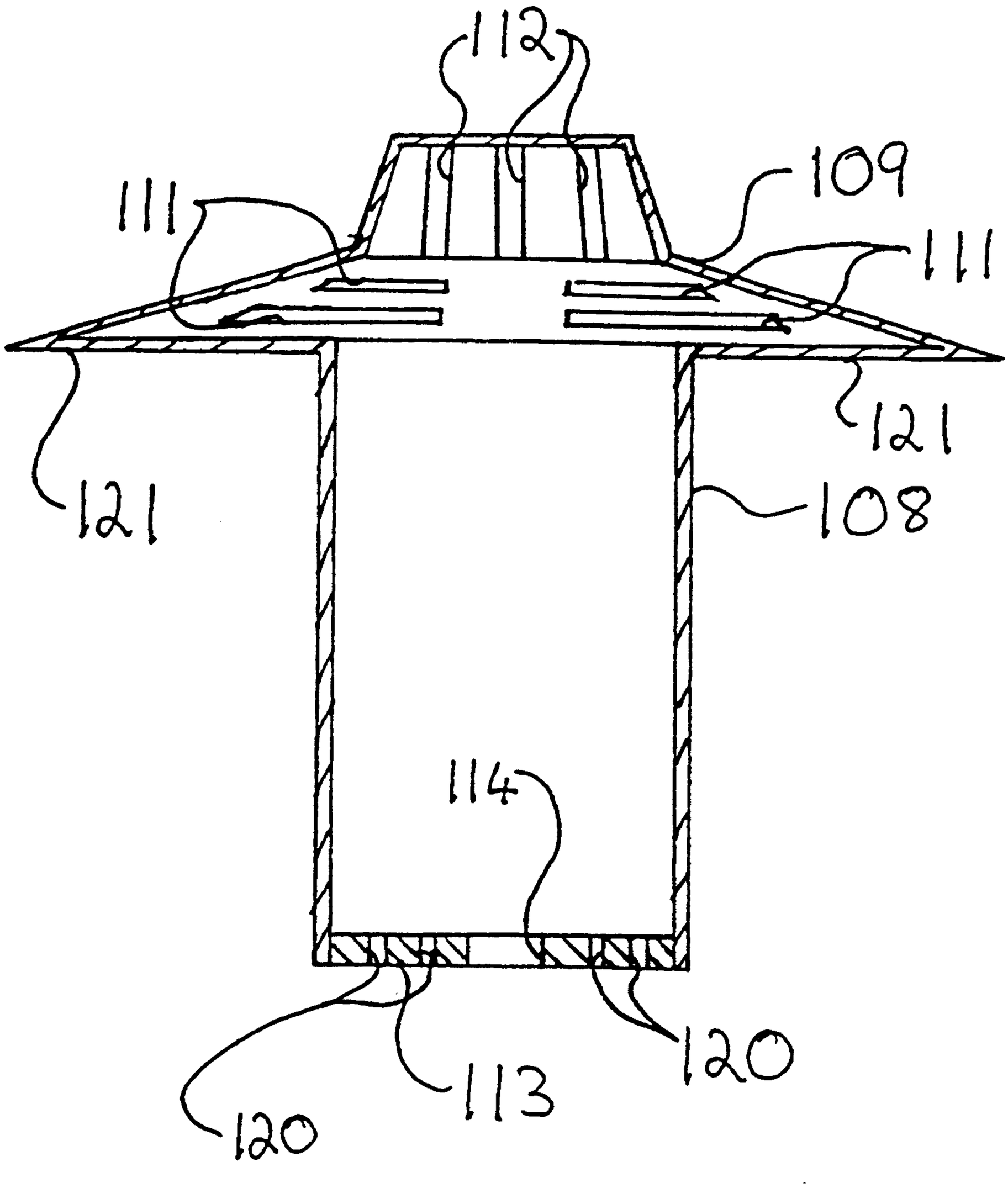


Figure 3

DRAINAGE DEVICE

The invention relates to a drainage device and in particular a drainage device for a waste water outlet in a shower, bath or sink.

In accordance with the present invention, a drainage device for a waste water outlet comprises an outer tubular member adapted to fit within the waste water outlet, an inner tubular member located within the outer tubular member, the interior of the inner tubular member providing a first outlet and a second outlet being defined by the external wall of the inner tubular member and the internal wall of the outer tubular member, and a valve member movably mounted with respect to the inner and outer tubular members for movement between a first position in which the second outlet is obturated and the first outlet is open to permit a liquid to flow therethrough, and a second position in which the second outlet is open to permit liquid to enter the second outlet.

Preferably, the valve mechanism is slidably mounted on the inner or the outer tubular member and is preferably slidably mounted within the inner tubular member.

Typically, the valve mechanism comprises a flange which obturates the second outlet when the valve mechanism is in the first position, and is raised away from the second outlet to permit liquid to enter the second outlet when the valve mechanism is in the second position.

Typically, the valve mechanism may comprise a tubular member through which liquid may flow into the inner tubular member.

Preferably, the valve mechanism comprises a filter device to prevent or minimise the possibility of solid objects entering the first outlet. Typically, solid material is trapped in or on the filter device.

Preferably, the valve mechanism is biased to the second position and may be moved to the first position by a force applied to the valve mechanism to move the valve mechanism from the second to the first position.

Preferably, the inner tubular member is located concentrically within the outer tubular member. Typically, the outer tubular member, the inner tubular member and the valve mechanism are all concentric.

Typically, the inner tubular member is adapted to be coupled to a drain pipe which leads to a drainage or sewerage system and the outer tubular member is adapted to be coupled to a waste water tank so that water entering the second outlet flows between the inner and outer tubular members and into the tank.

Where the drainage device is installed in a waste water outlet of a sink, bath or shower, the waste water from the waste water tank may subsequently be used as a water supply for a cistern for flushing a toilet.

An example of a drainage device in accordance with the invention will now be described with reference to the accompanying drawings, in which:

FIG. **1** is a schematic view showing a drainage device;

FIG. **2** is a diagram showing a system for reusing waste water incorporating the drainage device; and,

FIG. **3** is a cross-sectional view of a central pipe and top cover forming part of the drainage device.

FIG. **1** shows a drainage device which may be installed in an outlet in a bath or sink or shower tray. The drainage device **101** includes an outer housing **102** in the form of a tubular pipe and an inner pipe **103** concentrically mounted within the outer housing **102** by means of a rubber support **104**. The support **4** has an inner rim **105**, an outer rim **106** and support members **107** extending between the rims **105**, **106**. The outer rim **106** engages with and is fixed to the top edge of the housing **102** and the inner rim **105** engages with and is fixed to the top edge of the inner pipe **103**. The lower end of the inner pipe **103** is dimension to permit it to be connected to a conventional drain pipe **110**.

Located within the inner pipe **103** is a central pipe **108** with a top cover **109** (see also FIG. **3**) which has a number of slots **111**, **112** which permit water to enter the central pipe **108**. The slots are dimensioned such that water can pass through the slots but solid material is prevented from passing through the slots **111**, **112** and gathers on the top surface of the cover **109**.

The lower end of the central pipe **108** has a perforated plate **113** with perforations **120** and a central aperture **114** through which a bolt **115** extends. The bolt **115** has a head **119** which fits through the aperture **114**. The bolt **115** also extends through a second plate **116** fixed within the inner pipe **103** and is retained by a nut **117** on the opposite side of the plate **116** from the plate **113**. A helical spring **118** is located between the plates **116** and **113** to bias the central pipe **108** and top cover **109** away from the support **104** so that the plate **113** butts against the head **119** of the bolt **115** and the top cover **109** is raised above the support **104**, as shown in FIG. **1**. As the bolt head **119** which fits through the aperture **114**, the central pipe **108** and top cover **109** may be removed from the inner pipe **103** for cleaning.

By applying downwards pressure to the top cover **109**, the top cover **109** and central pipe **108** move downwards to compress the spring **18** and move the plate **113** towards the plate **116**. When the top cover **109** and central pipe are pushed fully downwards, underside **121** of the top cover **109** obturates the slots between the support members **107** so that water is prevented from flowing through the slots **107**. When the slots **107** are obturated, water flows through the slots **111**, **112** in the top cover **109** and through the central pipe **108** and plate **113** into the inner pipe **103** and exits the inner pipe **103** through the perforated plate **116** into the drain pipe **110**.

In use, the drainage device **101** is installed in an outlet of a sink, bath or shower tray such that the top edge of the support ring **104** is flush with the surface of the sink, bath or shower tray adjacent to the outlet.

FIG. **2** shows an example of a system for reusing waste water in which the drainage device **101** can be used. In this example, the device **101** is installed in a waste water outlet **12** from a shower tray **2**.

FIG. **2** shows two water consuming appliances: a washing machine **1**; and a shower tray **2** which forms part of a shower. An outlet **3** from the washing machine **1** is connected to a water pipe **32** which is connected to an inlet of a control valve **4** which has two outlets **5**, **6**. The outlet **5** is connected to a water pipe **33** which connects the control valve **4** to a used water tank **7** and the outlet **6** is coupled to a drain **8**.

The used water tank **7** includes a manually operated tap **9** which permits water to be drawn from the tank **7**, for example, into a container such as a bucket. The tank **7** also has an outlet **10** which is connected by a water pipe **34** to a second used water tank **11** located below the shower tray **2**. The shower tray **2** has a waste water outlet **12** which is connected to the second used water tank **11** and permits water to flow from the shower tray **2** into the used water tank **11**.

The used water tank **11** has an outlet **13** and an overflow **14** which is connected to a drain **15**. The outlet **13** is connected by a water pipe **16** to a two way valve **17** via a water pump **18**. The water pipe **16** is coupled to a first inlet **19** of the valve **17** and a second inlet **20** is coupled by a water

pipe **21** to a cold water tank **22** which is filled by a water pipe **23** connected to a fresh (or unused) water source. The valve **17** also has an outlet **24** which is coupled by a water pipe **25** into a cistern **26** which is used to store water for flushing a toilet **27**. The water for flushing the toilet **27** passes from the cistern **26** to the toilet **27** via a conduit **28**.

A control box **29** is powered by a mains power supply **30** and is connected to a water level sensor **31** in the cistern **26**, and to the water pump **18**.

The valve **17** may be manually operable to connect the first inlet **19** or the second inlet **20** to the outlet **24**. Alternatively, the valve **17** may be operable automatically under control of the control box **29**. For example, the valve **17** may be an electromechanical valve which is controlled by the control box **29** and the control box **29** is coupled to the pump to detect whether the pump is pumping water when it is operated. If the control box **29** detects that there is no water to be pumped through the pipe **16** when the water pump **18** is operating, then the control box **29** switches off the water pump **18** and switches the valve **17** so that the second inlet **20** is coupled to the outlet **24**.

In use, during the washing cycle of the washing machine **1**, waste water flows from the outlet **3** of the washing machine **1** to the control valve **4** through the conduit **32**. If the water from the washing machine is from the first portion of the washing cycle, then the control valve **4** is operated to discharge the used water through the outlet **6** to the drain **8**. However, for a subsequent portions of the cycle, when the water exiting the outlet **3** is cleaner, the control valve **4** switches to pass the water to the outlet **5** and into the used water tank **7** through the pipe **33**.

Water may then be drawn from the used water tank **7** by means of the tap **9** into to a container, such as a bucket. Alternatively, the water from the water tank **7** is passed out by the pipe **34** to the used water tank **11**. The used water tank **11** collects used water from the washing machine **1** via the tank **7** and from the shower tray **2** via the drain **12**. Used water is then stored in the used water tank **11** and any excess water is discharged from the tank **11** through the overflow outlet **14** and into the drain **15**.

When the toilet **27** is flushed, water from the cistern **26** passes through the pipe **28** to the toilet **27** and the cistern **26** empties of water. The control box **29** detects a drop in the water level in the cistern **26** by means of the water level sensor **31** and switches on the water pump **18** to pump water from the used water tank **11** through the pipe **16** to the valve **17**. If the control box **29** detects water being pumped by the pump **18**, the valve **17** is actuated such that the first inlet **19** is switched to the outlet **25**. Hence, water from the pipe **16** passes through the valve **17** out of the outlet **24** and into the pipe **25** to fill the cistern **26**. When the cistern **26** has sufficient water in it, the control box **29** detects this via the water level sensor **31** and switches off the pump **18**.

If the control box **29** detects that the pump is not pumping water when it is switched on, this indicates that there is no water in the tank **11** and the control box **29** switches off the pump **18** and switches the valve **17** so that the second inlet **20** is connected to the outlet **24**. Hence, water from the cold water tank **22** passes through the pipe **21**, the valve **17** and pipe **25** into the cistern **26** to fill the cistern **26**.

As an alternative to having the valve mechanism **17**, it is possible that the pipe **21** and the pipe **16** may discharge water directly into the cistern **26**. In such a mechanism, the pipe **21** would have a valve operated by conventional float type valve in the cistern **26** and when toilet **27** is flushed, a mixture of waste water from the tank **11** and clean water from the cold water tank **22** would fill the cistern **26**. In this alternative example, preferably, the amount of water filling the cistern **26** from the pipe **16** would be greater than the amount of water filling the cistern **26** from the pipe **21**.

The end of the inner pipe **103** adjacent to the perforated plate **116** is connected to the waste water drain pipe **110**. The lower end of the outer housing **102** is coupled to an inlet of the used water tank **11** which encircles the lower end of the inner pipe **103** and the upper end of the drain pipe **110**.

Hence, if the central pipe **108** and top cover **109** are in the position shown in FIG. **1**, water from the shower tray **2** flows through the slots between the support members **107** and between the annulus defined by the outer surface of the inner pipe **103** and the inner surface of the housing **102** and into the waste water tank **11** for storage and reuse (in this example) as water for flushing the toilet **27**. However, if the central pipe **108** and top cover **109** are pressed downwards, the underside **121** of the top cover **109** obturates the apertures between the support members **107** and water from the shower tray **2** must flow through the slots **111**, **112** into the central pipe **108** and through the inner pipe **103** into the waste water drain pipe **110**.

Therefore, the invention permits a user to select whether water in a sink, bath or shower tray is to be reused. If a user decides that the water is too dirty to reuse, the user presses the top cover **109** downwards (for example, by using a hand or foot to apply a downward force to the top cover **109**) so that the water in the sink, bath or shower tray drains into the waste water drain pipe **110**. Alternatively, if the water is sufficiently clean to be reused, the user can remove the force from the top cover **109** to permit the top cover **109** and central pipe **108** to move to the position shown in FIG. **1** and water is permitted to enter the annular space between the outer surface of the inner pipe **103** and the inner surface of the housing **102** to flow into a waste water tank for reuse.

What is claimed is:

1. A drainage device for a waste water outlet comprising an outer tubular member adapted to fit within the waste water outlet, an inner tubular member located within the outer tubular member, the interior of the inner tubular member providing a first outlet and a second outlet being defined by the external wall of the inner tubular member and the internal wall of the outer tubular member, and a valve member movably mounted with respect to the inner and outer tubular members for movement between a first position in which the second outlet is obturated and the first outlet is open to permit a liquid to flow therethrough, and a second position in which the second outlet is open to permit liquid to enter the second outlet.

2. A drainage device according to claim **1**, wherein the valve mechanism is slidably mounted on the inner or the outer tubular member.

3. A drainage device according to claim **2**, wherein the valve mechanism is slidably mounted within the inner tubular member.

4. A drainage device according to claim **1**, wherein the valve mechanism comprises a flange which obturates the second outlet when the valve mechanism is in the first position, and is spaced from the second outlet to permit liquid to enter the second outlet when the valve mechanism is in the second position.

5. A drainage device according to claim **1**, wherein the valve mechanism comprises a third tubular member.

6. A drainage device according to claim **5**, wherein the valve mechanism comprises apertures to permit water to enter the third tubular member and flow through the third tubular member to the first outlet.

7. A drainage device according to claim **6**, wherein the valve mechanism comprises a filter device at the apertures.

8. A drainage device according to claim **7**, wherein the filter device is provided by the shape and configuration of the apertures.

9. A drainage device according to claim **1**, wherein the valve mechanism is biased to the second position and may be moved to the first position by a force applied to the valve mechanism to move the valve mechanism from the second to the first position.

10. A drainage device according to claim **1**, wherein the drainage device is adapted to be mounted in a waste water outlet in a shower, bath or sink.

11. A shower tray comprising a drainage device in accordance with claim **1**.

* * * * *